

Application No.: 10/538,522
Amendment dated: February 8, 2007
Reply to Final Office Action of September 8, 2006
Attorney Docket No.: 21295.0106US1 (E0664US)

b.) Remarks

Turning first to the Office Action Summary Sheet, Claims 1-16 are pending in this application. Claims 1-16 are rejected. Claim 1 has been amended.

Claims 1, 5, 6 and 16 were rejected under 35 U.S.C. 102(e) over Kawano (US2003/0058530). This rejection is respectfully traversed for the following reasons.

Applicants would like to draw the attention of the Examiner to the following concept of conjugated planes in optical microscopy.

There are two sets of conjugate focal planes that exist along an optical path in a microscope. One set is referred to as an image or object forming conjugate set, and the other is referred to as an aperture or illuminating conjugate set¹. All conjugated planes in one set are simultaneously in focus. In the set of imaging planes they are all simultaneously in focus and are viewed when an object (sample, specimen) is in focus. The set of aperture planes is not viewed in focus on the sample plane, but requires focusing on the rear aperture plane (exit pupil) of the objective of the microscope. The two sets of conjugated planes are reciprocal in the way that when a specimen is in focus in the imaging set of planes, it will not be in focus in the aperture set of planes. In other words, when a sample is in focus in a microscope, the planes corresponding to the illumination conjugate set of planes will not be visible on the specimen plane. Optically, in the illuminating conjugate set the light beams corresponding to that set focus on the aperture planes, while in the imaging conjugate set the light beams corresponding to that set focus on image-forming planes. The light beams that are focused in one conjugated set are almost parallel in the other conjugated set.

Turning now to the optical system of the reflected light microscope claimed in Claim 1, the relationship between the claimed optical elements in that Claim is that of the illuminating conjugated set of planes. In Claim 1 lens 17 (the microscope objective) is characterized by its pupil plane 29 (also can be interchangeably referred to as an aperture

¹ The two conjugate sets of planes exist in the optical path of the microscope. The illumination beam path in the microscope is, of course, a part of the optical path, so both the imaging conjugate set and the illuminating conjugate set exist in the illumination beam path.

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plane in the literature pertaining to microscopy). That pupil plane 29 is optically conjugated with Fourier plane, which is the focal plane 9 of imaging optics 27. At least one attenuation element is disposed in that focal plane 9 of optics 27. Since according to the present invention, the structure of the attenuation element must not be focused on the plane in which the sample is in focus, that focal plane 9 must be conjugated with the planes in the illuminating plane set. Which is precisely what is claimed in Claim 1 by the language "imaging optics disposed along the illumination beam path and having a focal plane which optically conjugates with the pupil plane by being a Fourier plane of the pupil plane of the lens". Focal plane 9 is an optical conjugate of the pupil plane 29, which is a rear aperture plane in the illuminating conjugate plane set. Focal plane 9 in which at least one attenuating element is disposed is a plane in the illuminating conjugated set of planes not visible on the specimen plane in the imaging set.

This is also unequivocally explained in paragraph [0012] of the specification which says that "*Because the attenuating element according to the invention is arranged in the illumination light beam on a plane that corresponds optically to the pupil plane of the lens--that is, on a Fourier plane of the pupil plane of the lens, which Fourier plane is the focal plane of the imaging optics,-- the structure of the attenuation element, which can, for example, have a grate or sieve structure, is not visible in the sample plane being observed.*"

Turning now to the Kawano disclosure, it is stated in paragraph [0030] referred to by the Patent Office in the Office Action that "[T]he focal lengths of the collector lens 4 and the illuminating lens 6 and the positions of the collector lens 4, the illuminating lens 6, the field stop 5 and the objective 1 are determined so that an image of the field stop 5 is formed on the surface of the sample S" (emphasis added). Kawano requires that the field stop 5 be imaged onto the plane of the sample S. It is clear that the position of field stop 5 is conjugated with sample plane S and is in the imaging conjugated plane set of the microscope, not the illuminating set, as claimed in Claim 1. This is completely contrary to Applicants' invention claimed in Claim 1, which requires that the structure of the

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attenuation element be invisible in the specimen plane, therefore, disposing the attenuation element in the illuminating conjugated set of planes.

Furthermore, paragraph [0048] of Kawano, referred to by the Patent Office, says that "[A]n AOTF or an AOM (Acousto-Optic Modulator) 13 is placed at the position of the field stop 5 (in the vicinity of a position conjugate to the surface of the sample S and coincident with the front focal point of the illuminating lens 6)" (emphasis added). Again, the AOTF in Kawano the AOTF is disposed in the plane (of field stop 5) conjugate to the imaging plane set, not in the focal plane optically conjugated with the aperture (or illuminating) plane set.

This difference between the present invention and the Kawano disclosure is well illustrated in Figs. 1 and 4 of Kawano. The place in Fig. 1 where field stop 5 is disposed is clearly not in the focal plane of either lens 6 or lens 4 (the light beam is not focused in the plane where field stop 5 is). The same can be seen in Fig. 4 where the AOTF 13 is placed in the parallel beam of light propagating between lenses 6 and 4 and not in the focal plane of either of these lenses. This is completely contrary to what is claimed in Claim 1, which requires that at least one attenuation element be disposed in the focal plane of the imaging optics. If an attenuation element were placed in the plane of field stop 5, as disclosed in Kawano and according to the requirements of the Kawano optical arrangement, it would be imaged in sample plane S. This is exactly what the present invention seeks to avoid, therefore, placing an attenuation element in a focal plane of the imaging optics which is optically conjugated with the aperture plane (rear pupil plane) of the lens (which is the microscope objective) in Claim 1.

In view of the above-presented explanation and arguments, Applicants assert that the Kawano disclosure does not (and cannot) disclose each and every element of the present invention as claimed in Claim 1. In particular, Kawano does not disclose at least one attenuation element disposed in the focal plane of the imaging optics, which focal plane optically conjugates with the pupil plane of the lens (microscope objective) by

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being a Fourier plane of the pupil plane. Therefore, Claim 1 is not anticipated by Kawano and should be allowed.

Claims 5-6 and 16 depend off Claim 1 and are allowable.

Claims 3, 7-11 and 13 were rejected under 35 U.S.C. 103(a) over Kawano (US2003/0058530). This rejection is respectfully traversed for the same reasons as presented above with regard to Claims 1, 5-6 and 16 due to the lack of corresponding disclosure in Kawano. Therefore, Claims 3, 7-11 and 13 are allowable.

Claim 2 was rejected under 35 U.S.C. 103(a) over Kawano (US2003/0058530) in view of Ebbesen (US 6,052,238). Claim 4 was rejected under 35 U.S.C. 103(a) over Kawano (US2003/0058530) in view of Bourdelais (US 2004/0027672). Claim 12 was rejected under 35 U.S.C. 103(a) over Kawano (US2003/0058530) as applied to claim 11 above, and further in view of Fay et al. (US 5,009,488). Claims 14-15 were rejected under 35 U.S.C. 103(a) over Kawano (US2003/0058530) in view of Watanabe et al. (US 6,384,967).

These rejections are respectfully traversed for the same reasons presented above. The lack of the disclosure in Kawano of at least one attenuation element disposed in the focal plane of the imaging optics, which focal plane optically conjugates with the pupil plane of the lens (microscope objective) by being a Fourier plane of the pupil plane. The secondary references cited by the Patent Office do not provide the missing disclosure of Kawano. Therefore, the cited combination of patent does not disclose all the elements of the invention as claimed in Claims 2, 4, 12 and 14-15. Therefore, these Claims meet the patentability requirements of 35 U.S.C. 103(a) and are allowable.

Applicants draw the attention of the Examiner to the fact that no new claim elements are introduced by the present amendment. The underlined element by being a Fourier plane of the pupil plane of the lens is not new, it was made in the amendment dated July 24, 2006. In compliance with the claim objection made in the Office Action of September 8, 2006, this informality of not underlining that element has been corrected.

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Applicants have changed the words "corresponds to" to "conjugates with" in Claim 1. This change was done simply for the purpose of using an interchangeable term which does not change the meaning of that claim element, but emphasizes a better English usage of the term that was translated from the German language. Applicants hope that this term clarifies the concept of optical correspondence or optical conjugation of the corresponding planes as claimed in Claim 1.

With regard to the objection to the drawing, the Office Action stated that the element "Fourier plane" must be shown in the drawings. Applicants respectfully point out that the Fourier plane is already depicted in Fig. 1. The Fourier plane of the pupil in Claim 1 is focal plane 9 of the imaging system. That Fourier plane is the same as focal plane 9 (by means of optical conjugation described in paragraph [0012] of the specification and also in detail in this response), and it is correspondingly shown as plane 9. So the drawings are in compliance with 37 CFR 1.121(d).

Applicants believe that the present application is in condition for allowance. A Notice of Allowance is respectfully solicited. Should any questions arise, the Examiner is encouraged to contact the undersigned.

Respectfully submitted,

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